

WHAT IS CLAIMED IS:

1. A cooled mirror for laser applications having a mirror body provided with a mirror surface, the mirror body including several layers connected in a stack-like arrangement, the several layers including a cooler structure provided with connection for an inlet and outlet supplying coolant to the cooler structure, whereby the top layer of the several layers is made from copper forming or containing the mirror surface, comprising:

a first intermediate layer made of a material with a reduced heat expansion coefficient equal to or smaller than 10×10^{-6} [1/K], said first intermediate layer directly adjacent to the top layer;

a bottom layer made from copper facing away from the top layer;

a second intermediate layer directly adjacent to said bottom layer, said second intermediate layer made of a material with a reduced heat expansion coefficient;

the cooler structure formed from a plurality of copper cooler layers provided between said first and second intermediate layers formed with a plurality of openings, with the area surrounding said openings forming continuous posts that extend in one axis direction perpendicular or crosswise to the mirror surface across the entire thickness of the cooler structure; and

wherein all layers of the mirror body connect with each other on the surface by means of direct copper bonding technology or active soldering.

2. The mirror in accordance with claim 1, further including a first non-structured copper outer layer provided on one side of the cooler structure and a second copper outer layer provided on a second side of the cooler structure.

3. The mirror in accordance with claim 1, wherein the mirror body is symmetrical to a middle plane extending between the mirror surface and said bottom layer.

205701-11098007

4. The mirror in accordance with claim 1, wherein said first and second intermediate layers are made of ceramic, preferably aluminum oxide, aluminum nitride or silicon carbide ceramic.

5. The mirror in accordance with claim 1, wherein said first and second intermediate layers are made of copper silicon carbide or aluminum silicon carbide.

6. The mirror in accordance with claim 1, wherein said first and second intermediate layers have a thickness that is greater than the thickness of the top layer and said bottom layer.

7. The mirror in accordance with claim 6, wherein said first and second intermediate layers have a thickness between approximately 0.2 - 5 mm.

8. The mirror in accordance with claim 1, wherein the top layer has a thickness between 0.1 - 0.6 mm.

9. The mirror in accordance with claim 1, wherein said bottom layer is part of a flange extending beyond the remaining circumference of the mirror.

10. The mirror in accordance with claim 9, wherein said flange comprises at least one of said cooler layers, said second intermediate layer and said bottom layer.

11. The mirror in accordance with claim 9, wherein said flange is symmetrical to a plane extending from the bottom of the mirror.

12. The mirror in accordance with claim 1, wherein the mutual distance between said posts is approximately 1.0 - 8.0 mm.

13. The mirror in accordance with claim 1, wherein said cooler layers form material sections or wings extending radially to said posts and projecting from them.

14. The mirror in accordance with claim 1, wherein the first layer has a diamond milled surface, preferably such that the roughness is less than 10 nm and deviations in the flatness are less than 1 µm.

15. The mirror in accordance with claim 1, wherein the mirror surface is formed by applying a layer of metal, such as Ni, Au, Ag, Pt, Pd or a metal alloy.

16. The mirror in accordance with claim 15, wherein said layer of metal has a thickness that is significantly less than the thickness of the top layer, for example, a thickness of 0.1 to 20 µm.

17. The mirror in accordance with claim 1, wherein the connection for the inlet and outlet face away from the mirror surface.

18. The mirror in accordance with claim 2, wherein the copper of the top layer, said bottom layer and said cooler layers including said first and second outer layers is a copper alloy.

19. The mirror in accordance with claim 2, wherein the copper of the top layer, said bottom layer and said cooler layers including said first and second outer layer, is a low-oxygen or oxygen free copper.

20. The mirror in accordance with claim 2, wherein at least one of the top layer, said bottom layer, said first and second intermediate layers, and said cooler layers including said first and second outer layers, comprises at least two single layers lying flat together and connected with each other.

2055701470001

21. A method for manufacturing a mirror provided with a mirror body containing a plurality of layers, comprising the steps of:

stacking the layers one above the other;
connecting adjacent layers together utilizing direct copper bonding or active soldering; and
diamond milling the top layer.